

DOCKET NO: 250365US2

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF :
DAVID MOTTIER, ET AL. : EXAMINER: LAM, K. T.
SERIAL NO: 10/815,724 :
FILED: APRIL 2, 2004 : GROUP ART UNIT: 2611
FOR: METHOD FOR EFFICIENT :
EQUALIZATION IN A
TELECOMMUNICATION SYSTEM
INCLUDING AT LEAST ONE MOBILE
TRANSCEIVER

REPLY BRIEF

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

SIR:

Applicant respectfully replies to the April 27, 2009 Examiner's Answer.

Claim 1 is directed to a method for transmitting data in a telecommunication system that includes at least a first transceiver and a second transceiver linked together by means of at least one communication channel, at least one of the transceivers being mobile, the method comprising: (1) spreading said data over a plurality of components; and (2) an equalization step of multiplying each of the components resulting from the spreading step by a corresponding predetermined equalization value representative of communication conditions within the communication channel, wherein at least one predetermined equalization value is determined so as to account for a Doppler effect resulting from a movement of the mobile transceiver, which adversely affects the communication conditions within the communication channel, wherein each predetermined equalization value is calculated using an equation that

includes a parameter representative of a noise level in the communication channel and an additional noise variance representative of the Doppler effect.

Claims 1, 3-7, and 9-12 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent Application Publication No. 2003/0123384 to Agee (hereinafter "the '384 application") in view of U.S. Patent No. 7,286,593 to Banerjee (hereinafter "the '593 patent"), further in view of U.S. Patent Application Publication No. 2005/0018641 to Zhao et al. (hereinafter "the '641 application").

As set forth in the Appeal Brief, regarding the rejection of Claim 1 under 35 U.S.C. §103(a), the Office Action asserts that the '384 application discloses everything in Claim 1 with the exception of "detailed disclosure of the equalization equations,"¹ and relies on the '593 patent and the '641 application to remedy that deficiency.

The Examiner's Answer initially repeats the rejections set forth in the final Office Action, and then provides a Response to Arguments section.

In particular, the Appeal Brief presented arguments that the '641 application fails to disclose that, in an equalization step in which each of the components resulting from a spreading step is multiplied by a corresponding predetermined equalization value, each predetermined equalization value is calculated using an equation that includes a parameter representative of a noise level in the communication channel and an additional noise variance representative of the Doppler effect, as required by Claim 1.

In response, page 11 of the Examiner's Answer again broadly refers to Equations 3-7 of the '641 application. In addition, the Examiner's Answer provides this additional sentence of explanation: "[t]he window length P that includes variance of Gaussian White Noise

¹ See page 3 of the outstanding Office Action.

disclosed in Equation 7 and estimated white noises are part of estimated instantaneous channel coefficient in Equations 3 and 4."²

As discussed in the Appeal Brief, the '641 application is directed to a method and apparatus for adjusting an average interval of channel estimation dynamically based on Doppler shift. The method comprises the steps of estimating Doppler shift by using a level crossing rate (LCR) according to different moving speeds of mobile terminals; determining the optimal average interval of channel estimation based on the relationship between the existing Doppler shift and the optimal average interval of channel estimation; dynamically adjusting the average interval of channel estimation according to the determined optimal average interval of channel estimation to make the coherent receiver obtain the optimal estimation performance at different moving speeds. As shown in Figure 1, the '641 application discloses a system in which the number of level crossings (with positive slope) at a fixed interval T is calculated as the number of crossings M/T . This value is used as an estimate of the Doppler shift.³ See also equation 6, which provides an estimate of the Doppler shift f_d for the i th finger of the RAKE receiver, which is again based on the number of crosses of the average level. Further, as shown in equation 7, the '641 application discloses a formula for the optimal average interval of channel estimation P . Thus, equation 7 produces an optimal average interval of channel estimation, which is a window length. As noted in the Examiner's Answer, the optimal average window length P is used as a divisor in Equation 4, which is used to estimate values for the channel parameters.

However, Applicants respectfully submit again that '641 equation 7 does not determine equalization values that are used to multiply each of the components resulting from a spreading step, as required by Claim 1.

² See Examiner's Answer, page 11, lines 14-16. Emphasis added.

³ See '641 application, paragraph [0014].

Moreover, none of '641 equations 4-7 include the claimed "additional noise variance representative of said Doppler effect." Rather, the '641 application discloses that the Doppler shift f_d itself is computed and used in equation 7 to calculate the window length P. Thus, there would be no need for the '641 system to include an "additional noise variance representative of said Doppler effect." Further, '641 equation 7 merely includes a white noise variance and the power of each arriving path.

Moreover, Applicants note that the estimated Doppler shift f_d disclosed by the '641 application is not a variance, as required by Claim 1. In this regard, Applicants respectfully submit that the term "variance" is a well known term in statistics and would have a particular meaning to one of ordinary skill in this art, e.g., the square of the standard deviation. Applicants also note that this meaning of the term variance is consistent with the term's use in the specification. Further, Applicants note that this argument was presented in the Request for Reconsideration filed July 24, 2008, and in the Appeal Brief, but was not addressed by the Examiner's Answer.

Further, as discussed above, '641 equations 4-7 are implemented in a receiver, and are not performed as part of spreading and equalization in a transmitter, as required by Claim 1, which is directed to a "method of transmitting...."

Further, it is unclear to Applicants how the '641 system, in which a window length P is calculated by equation 7 and channel estimates are calculated using P in equation 4, are to be combined with the system disclosed by the '384 application. As discussed above, Claim 1 requires that, in an equalization step in which each of the components resulting from a spreading step is multiplied by a corresponding predetermined equalization value, each predetermined equalization value is calculated using an equation that includes a parameter representative of a noise level in the communication channel and an additional noise variance representative of the Doppler effect. In other words, how do '641 equations 4-7 relate to

"equalization values" asserted to be disclosed by the '384 application, which must multiply components from a spreading step?

The Office broadly relies on the "delay, Doppler, pre-emphasis unit 280" disclosed by the '384 application as being functionally "equivalent" to the claimed multiplying, but offers no details. Further, the Office relies on the '593 patent to disclose "weight coefficients" so as to cure any and all of the deficiencies of the '384 application in this regard. However, in addition to the deficiencies of the '593 patent set forth in the Appeal Brief, Applicants note that that '593 Figure 3, which was cited by the Examiner's Answer, is directed to a RAKE receiver, and it is unclear how the teachings of '593 Figure 3 can be combined with '384 "delay, Doppler pre-emphasis" unit 280. The final Office Action and the Examiner's Answer do not provide any guidance in this regard. Further, what role does the '641 window length P play in the suggested '384-'593 combination? The Reply Brief appears to focus on '641 equation 7, which calculates the window length P, but there is no connection between P and the claimed equalization values.

Thus, no matter how the teachings of the '384 application, the '593 patent, and the '641 application are combined, the combination does not teach or suggest an equalization step of multiplying each of the components resulting from a spreading step by a corresponding predetermined equalization value, wherein each predetermined equalization value is calculated using an equation that includes a parameter representative of a noise level in the communication channel and an additional noise variance representative of the Doppler effect, as required by Claim 1. Accordingly, Applicants respectfully submit that a *prima facie* case of obviousness has not been established and that the rejection of Claim 1 (and all similarly rejected dependent claims) should be withdrawn.

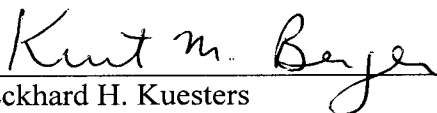
Further, Applicants respectfully submit that one of ordinary skill in the art would not have been motivated to combine the teachings of the '384 application, the '593 patent, and

the '641 application, as suggested by the outstanding Office Action. As discussed in the Appeal Brief, the '593 patent teaches away from using an additional noise variance representing a Doppler effect, and is thus not combinable with the teachings of the '384 application and the '641 application. The '593 patent discloses that "**there is no need for a Doppler estimator** or a per finger SIR estimator" and that "the filter structure does not change with changes in ... Doppler and SIR."⁴ Thus, one of ordinary skill in the art would not have been motivated to combine the teachings of the '593 patent with those of the '384 and '641 application, which appear to require Doppler estimation, since the '593 patent explicitly discloses that Doppler estimation (which is more complicated and consumes more power) is not required. Moreover, as discussed above, it is unclear to Applicants how the cited references can be combined, since the '593 patent and the '641 application relate to RAKE receivers, while the '384 patent does not. For these additional reasons, Applicants respectfully submit that a *prima facie* case of obviousness has not been established and that the rejection of Claim 1 (and all similarly rejected dependent claims) should be withdrawn.

For the foregoing reasons, the final rejection should be reversed.

Respectfully submitted,

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⁴ '593 patent, column 12, lines 39-43. Emphasis added.